

1. Internal combustion engine system, comprising:

an internal combustion engine operating on ethanol, the engine having a compression ratio in the range of 11-16; and

means for introducing into the engine fuel/air mixtures including an amount of hydrogen to substantially eliminate misfire at a first equivalence ratio in the range of 0.4 – 0.7 when the engine is operating below a selected torque or power level and introducing into the engine fuel/air mixtures in a second equivalence ratio range wherein the second equivalence ratio is greater than the first equivalence ratio when the engine is operated above the selected torque or power level, the second equivalence ratio being sufficiently low at all times to prevent knock and further including a knock sensor to detect knock in the engine.

2. Internal combustion engine system, comprising:

an internal combustion engine operating on ethanol, the engine having a compression ratio in the range of 11-16;

means for introducing into the engine EGR along with a stoichiometric fuel/air mixture including hydrogen sufficient to prevent misfire and wherein the amount of EGR is always sufficient to prevent knock.